CLAIMS

I/We claim:

1. A heat dissipating system for an electronic power module, the system comprising:

a semiconductor die;

a substrate attached to the die so as to conduct heat from the die;

a heat sink attached to the substrate, wherein portions of the heat sink define a chamber, the chamber including a wall further defining a condensing surface;

a first fluid contained in the chamber; and

a base having portions defining a fluid passageway therein, and a second fluid within the passageway flows across an outer surface of the wall of the heat sink to transport the heat away from the heat sink.

2. The system according to claim 1, wherein the substrate is formed of metal.

3. The system according to claim 2, wherein the substrate is substantially copper.

4. The system according to claim 1, wherein the heat sink includes portions defining an aperture, and the substrate being mounted over the aperture.

5. The system according to claim 1, wherein the first fluid is a dielectric fluid.

6. The system according to claim 5, wherein a seal is located between the substrate and the chamber.

7. The system according to claim 1, wherein the outside surface of the wall of the heat sink includes at least one fin extending therefrom and providing additional surface area for dissipating heat.

8. The system according to claim 1, wherein portions of the base define an aperture, and the heat sink being mounted over the aperture.

9. The system according to claim 1, further comprising a seal located between the wall of the conduit and the wall of the heat sink.

10. The system according to claim 1, wherein the second fluid is substantially water.

11. The system according to claim 1, wherein the die is attached to the substrate by a phase changing solder material.

12. The system according to claim 11, further comprising a sealant attached between the die and the substrate to contain the phase changing solder material.

13. The system according to claim 1, wherein the heat sink includes fins on the condensing surface to provide additional surface area for improved condensation.

14. The system according to claim 1, the heat sink has a predefined orientation wherein the orientation is such that gravity causes the first fluid to return to the substrate after it has condensed on the condensing surface.

15. The system according to claim 1, wherein the substrate includes metal foam.

16. The system according to claim 1, wherein the substrate includes a metal foam member extending from the substrate, the metal foam configured to draw the first fluid towards the die.

17. The system according to claim 16, wherein the condensing surface includes plates extending therefrom into the first fluid.

18. The system according to claim 1, wherein the heat sink includes bellows configured to accommodate thermal expansion of the first fluid therein.

19. The system according to claim 1, further comprising metal foam attached to the outer surface of the chamber, the metal foam having passageways defined therethrough to allow the second fluid to flow through the metal foam.

20. A heat dissipating system for an electronic power module, the system comprising:

a semiconductor die;

a substrate attached to the die so as to conduct heat from the die;

a heat sink attached to the substrate, the heat sink including portions defining an aperture and the substrate being mounted to the heat sink over the aperture such that the heat sink and substrate cooperatively define a chamber, the chamber including a wall further defining a condensing surface;

a first fluid contained in the chamber; and

a base having portions defining a fluid passageway therein, and a second fluid within the passageway flows across an outer surface of the wall of the heat sink to transport the heat away from the heat sink.

21. The system according to claim 1, wherein the substrate includes metal foam.

22. The system according to claim 21, wherein the substrate includes substantially copper.

23. The system according to claim 20, wherein the first fluid is a dielectric fluid.

24. The system according to claim 20, wherein the substrate forms a wall of the chamber.

25. The system according to claim 24, wherein a seal is located between the substrate and the chamber.

26. The system according to claim 25, wherein the outside surface of the wall of the chamber includes at least one fin to provide additional surface area for dissipating heat.

27. The system according to claim 20, wherein a wall of the base has an aperture and the outside surface of the wall of the chamber is located in the aperture to allow the second fluid to flow across the outer surface of the wall of the chamber.

28. The system according to claim 27, further comprising a seal located between the wall of the channel and the outside surface of the wall of the chamber.

29. The system according to claim 20, wherein the second fluid includes substantially water.

30. The system according to claim 20, wherein the die is attached to the substrate using a phase changing solder material.

31. The system according to claim 30, further comprising a sealant attached between the die and the substrate to contain the phase changing solder material.

32. The system according to claim 20, wherein the heat sink includes fins on the condensing surface to provide additional surface area for improved condensation.

33. The system according to claim 20, wherein the orientation of the chamber is such that gravity causes the first fluid to return to the substrate after it has condensed on the condensing surface.

34. The system according to claim 20, wherein the porous material of the substrate is configured to draw the first fluid towards the die.

35. The system according to claim 20, wherein the condensing surface includes plates extending through the first fluid.

36. The system according to claim 20, wherein the heat sink includes bellows configured to accommodate thermal expansion of the dielectric fluid.

37. The system according to claim 20, further comprising metal foam attached to the outer surface of the chamber and configured to allow the second fluid to flow through the metal foam.